REMARKS

In the latest Office Action, claims 1-10, 12, 21-22 and 24-29 stand rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent No. 6,030,881 (Papasouliotis et al.) Applicants previously pointed out that Papasouliotis et al. teach a first step using an etch/dep ratio which is less than the etch/dep ratio used in the second step, which is in direct contrast to embodiments of the present invention, which teach that the etch/dep ratio of the first step is greater than the etch/dep ratio of the second step.

In response to applicants' arguments, the Examiner has acknowledged this point but reasons that Papasouliotis et al. teach repeating their steps a number of times, and that the use of "comprising" in applicants' claims leave them open to additional process steps. Specifically, the Examiner asserts that the first step in applicants' claims may be viewed as the second step of the prior art, and the second step in the claims may be viewed as the first step of the prior art. Applicants strongly disagree. One skilled in the art would certainly not interpret Papasouliotis' teaching of repeating the first and second steps as teaching that such steps may be performed in reverse order. Rather, Papasouliotis et al. specifically teach that in order to maximize the gap-filling capability of their process, the first deposition step should have an etch/dep ratio of less than or equal to 0.25, and the second step should have an etch/dep ratio of greater than 50. There is nothing in Papasouliotis et al. which would suggest to one skilled in the art that these steps could be reversed.

Further, in making the assertion that applicants' claims do not exclude any additional process steps, the Examiner has ignored the fact that the claims recite a process in which the second step fills the trench. See independent claims 1, 4, 5-9, 14, and 21-25 which recite that upon applying a second gas flow and RF bias, the trench is filled. However, to further distinguish applicants' claims from Papasouliotis et al., applicants have amended independent claims 1, 4 and 22 to recite "consisting of" language. Claim 1 as amended, claims 2-3 which depend therefrom, and amended claims 4 and 22 are clearly patentable over Papasouliotis et al.

With regard to independent claims 1, 4-9, 14, 21-26, and 29, applicants wish to reiterate that Papasouliotis et al. do not teach or suggest selecting a first gas flow and a first RF bias which achieves a first etch/dep ratio or a second gas flow and second RF bias which achieves a second etch/dep ratio as claimed. Nor do Papasouliotis et al. teach or suggest a step in which the first gas flow rate is lower than the second gas flow rate and/or a step in which the first RF bias is higher than the second RF bias as recited in claims 5-8. As taught in the present invention, the gas flow and RF bias are adjusted in order to control the etch/dep ratio. There is no teaching in Papasouliotis et al. which would lead one skilled in the art to adjust these conditions in order to achieve the claimed etch/dep ratio relationship.

With regard to claims 8, 21, 24, and 25, which recite that the first layer of trench filling material has a substantially v-shaped upper surface profile, the Examiner refers to Fig. 1D of Papasouliotis et al. as illustrating a v-shape. However, this figure refers to a "conventional" HDP deposition process discussed in the background portion of the reference in which a gap is filled by a simultaneous etch/dep process. There is no teaching or suggestion in Papasouliotis et al. that such a process includes two steps, the first of which results in a partially filled trench with a first layer of trench filling material having a substantially v-shaped upper surface profile as recited in applicants' claims. And, as applicants previously pointed out, Papsouliotis et al. clearly teach a first step in which cusps form as the gap is filled. See col. 5, lines 53-61 and Fig. 5A. Claims 8, 21, 24 and 25 are clearly patentable over Papasouliotis et al.

With regard to claims 27 and 28 which recite the specific etch/dep ratios, the Examiner has maintained that the etch/dep ratio is result effective and would be obvious to optimize. Applicants again wish to point out that no amount of optimization of Papasouliotis' teachings would achieve what applicants have claimed. The Examiner has provided no explanation as to why one skilled in the art would "optimize" Papasouliotis' etch/dep ratios in a manner which would result in an etch/dep ratio relationship which is directly contrary to what the reference teaches. Claims 27 and 28 are patentable over Papasouliotis et al.

Claims 11, 13-20, and 23 stand rejected under 35 U.S.C. 103(a) as being unpatentable over Papasouliotis et al. in view of U.S. Patent No. 5,872,058 (Van Cleemput et al.) The Examiner maintains that it would have been obvious to substitute hydrogen as taught in Van Cleemput for the inert gas in Papasouliotis to meet applicants' claims. Applicants wish to reiterate that even if one were to do so, the claimed method would not result. Neither Papasouliotis et al. nor Van Cleemput teach or suggest a method in which the first etch/dep ratio is selected to be **higher** than the second etch/dep ratio for the purpose of reducing void formation. Rather, Papasouliotis et al. achieve reduced void formation by utilizing a first etch/dep ratio which is **lower** than the second etch/dep ratio. Van Cleemput et al. achieve reduced void formation by reducing the concentration of the inert gas used.

Nor do Papasouliotis et al. or Van Cleemput et al. teach or suggest the specific gas flow rate ranges recited in claims 15, 17, and 19 for the purpose of achieving the claimed relationship of first and second etch/dep ratios as recited in claim 14 from which they depend. Nor do Papasouliotis et al. or Van Cleemput et al. teach or suggest the first and second RF bias values recited in claims 16, 18, and 20. As pointed out above, the gas flow and RF bias are selected in order to control the etch/dep ratio. As neither Papasouliotis nor Van Cleemput teach or suggest the claimed etch/dep ratios, there is no motivation to modify their methods to provide the claimed RF bias and gas flow rates. While the Examiner maintains that such variables would have been obvious to optimize, he has not pointed to any teaching in the references which would lead one skilled in the art to the modify the variables in a manner directly contrary to Papsouliotis' teachings to achieve the claimed etch/dep ratio. Claims 15-20 are patentable over the combined teachings of Papasouliotis et al. and Van Cleemput.

With regard to claim 23, the Examiner maintains that it would have been obvious to include a nitride layer in Papasouliotis et al. as taught in Van Cleemput in order to "provide protection to the sidewalls." However, there is no teaching or suggestion in Van Cleemput et al. of filling STI trenches using a nitride liner layer which is not substantially eroded during the filling of the trenches with first and second layers of trench filling materials as recited in claim

23. Rather, Van Cleepmut states only that passivation steps provide protection layers such as SiN or SION for the wafer. Even if one were to modify Papasouliotis as proposed, the claims would not be met as neither Papasouliotis et al. or Van Cleemput et al. teach using a first etch/dep ratio which is higher than the second etch/dep ratio as recited in claim 23.

For all of the above reasons, applicants submit that claims 1-29, as amended, are clearly patentable over the cited references. Entry of this amendment and early notification of allowance is respectfully requested.

Respectfully submitted,

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